[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 25

[Docket No. FAA-2001-_____; Notice No._____]

RIN 2120-_____

Operations in Icing Conditions

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of proposed rulemaking (NPRM).

SUMMARY: This proposal would amend the regulations applicable to transport category airplanes certificated for flight in icing. The proposal would require either the installation of a primary ice detection system; or the definition of visual cues for recognition of ice accretion on a specified surface, combined with an advisory ice detector that provides an alert. For airplanes with reversible flight controls in the pitch or roll axis, the proposal would also require a means to indicate to the flightcrew that the airplane is in conditions conducive to ice accumulation aft of the airframe's protected areas. This proposed regulation is the result of information gathered from a review of icing accidents and incidents, and it is intended to improve the level of safety when airplanes are operated in icing conditions.

DATES: Send your comments on or before [Insert date 90 days after date of publication in the Federal Register.].

ADDRESSES: Address your comments to the Docket Management System, U.S. Department of Transportation, Room Plaza 401, 400 Seventh Street, SW., Washington,

DC 20590-0001. You must identify the docket number FAA-2001-_____ at the beginning of your comments, and you should submit two copies of your comments. If you wish to receive confirmation that FAA received your comments, include a self-addressed, stamped postcard.

You may also submit comments through the Internet to http://dms.dot.gov. You may review the public docket containing comments to these proposed regulations in person in the Dockets Office between 9:00 a.m. and 5:00 p.m., Monday through Friday, except Federal holidays. The Dockets Office is on the plaza level of the NASSIF Building at the Department of Transportation at the above address. Also, you may review public dockets on the Internet at http://dms.dot.gov.

FOR FURTHER INFORMATION CONTACT: Kathi Ishimaru, FAA, Propulsion/Mechanical Systems Branch, ANM-112, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, WA 98055-4056; telephone (425) 227-2674; facsimile (425) 227-1320, e-mail kathi.ishimaru@faa.gov.

SUPPLEMENTARY INFORMATION:

Comments Invited

Interested persons are invited to participate in the making of the proposed action by submitting such written data, views, or arguments as they may desire. Comments relating to the environmental, energy, federalism, or economic impact that might result from adopting the proposals in this document also are invited. Substantive comments should be accompanied by cost estimates. Comments must identify the regulatory docket

or notice number and be submitted in duplicate to the DOT Rules Docket address specified above.

All comments received, as well as a report summarizing each substantive public contact with FAA personnel concerning this proposed rulemaking, will be filed in the docket. The docket is available for public inspection before and after the comment closing date.

All comments received on or before the closing date will be considered by the Administrator before taking action on this proposed rulemaking. Comments filed late will be considered as far as possible without incurring expense or delay. The proposals in this document may be changed in light of the comments received.

Commenters wishing the FAA to acknowledge receipt of their comments submitted in response to this document must include a pre-addressed, stamped postcard with those comments on which the following statement is made: "Comments to Docket No. FAA-2001-_____." The postcard will be date stamped and mailed to the commenter.

Availability of NPRM Documents

You can get an electronic copy using the Internet by taking the following steps:

(1) Go to the search function of the Department of Transportation's electronic Docket Management System (DMS) web page (http://dms.dot.gov/search).

(2) On the search page type in the last four digits of the Docket number shown at the beginning of this notice. Click on "search."

(3) On the next page, which contains the Docket summary information for the Docket you selected, click on the document number of the item you wish to view.

You can also get an electronic copy using the Internet through FAA's web page at http://www.faa.gov/avr/arm/nprm/nprm.htm or the Federal Register's web page at http://www.access.gpo.gov/su_docs/aces/aces140.html.

You can also get a copy by submitting a request to the Federal Aviation Administration, Office of Rulemaking, ARM-1, 800 Independence Avenue SW., Washington, DC 20591, or by calling (202) 267-9680. Make sure to identify the docket number, notice number, or amendment number of this rulemaking.

BACKGROUND

On October 31, 1994, an accident involving an Aerospatiale Model ATR72 series airplane occurred in which icing conditions, believed to include freezing drizzle droplets, were reported in the area. The FAA, Aerospatiale, the French Direction Générale de l'Aviation Civile, Bureau Enquète Accident, National Aeronautics and Space Administration (NASA), National Transportation Safety Board (NTSB), and others have conducted an extensive investigation of this accident. This investigation has led to the conclusion that freezing drizzle conditions created a ridge of ice aft of the deicing boots and forward of the ailerons, which resulted in uncommanded roll of the airplane.

Existing Regulations

Certification Regulations. The current regulations that are applicable to transport category airplanes for flight in icing conditions are contained in Title 14, Code of Federal Regulations (14 CFR) part 25 (§ 25.1419, "Ice protection"). This regulation requires that

an airplane must be able to safely operate in the continuous maximum and intermittent maximum icing conditions of 14 CFR part 25, appendix C. Appendix C characterizes continuous maximum and intermittent maximum icing conditions within stratiform and cumuliform clouds. Freezing precipitation (freezing drizzle and freezing rain) is not included. Appendix C defines icing cloud characteristics (for both small and transport airplanes) in terms of mean effective drop diameters, liquid water content, temperature, horizontal extent, and altitude. Icing conditions containing freezing drizzle and freezing rain sometimes result in mean effective diameters that are larger than the mean effective drop diameters defined in appendix C. Consequently, these icing conditions containing freezing drizzle and freezing rain are not considered during the certification of the airplane's ice protection system, and exposure to these conditions could result in hazardous ice accumulations.

Operating Regulations. There also are relevant regulations that apply to airplane operations, which are found in 14 CFR part 121 ("Operating Requirements: Domestic, Flag, and Supplemental Operations"). Specifically, § 121.629(a) ("Operation in icing conditions") states:

> "No person may dispatch or release an aircraft, continue to operate an aircraft en route, or land an aircraft when in the opinion of the pilot in command or aircraft dispatcher (domestic and flag operations only), icing conditions are expected or met that might adversely affect the safety of the flight."

Also, § 121.341 ("Equipment for operations in icing conditions") requires the installation of certain types of ice protection equipment and wing illumination equipment.

Neither the operating regulations nor the certification regulations require a means for the pilot-in-command specifically to identify that hazardous icing conditions have been encountered.

NTSB Safety Recommendations

The NTSB issued various safety recommendations to the FAA following the Model ATR72 accident. One of the recommendations, A-96-56, states in part that:

> ". . . If safe operations in certain icing conditions cannot be demonstrated by the manufacturer, operational limitations should be imposed to prohibit flight in such conditions and flightcrews should be provided with the means to positively determine when they are in icing conditions that exceed the limits for aircraft certification."

In response to the latter portion of this safety recommendation, the FAA tasked the Aviation Rulemaking Advisory Committee (ARAC), by notice published in the Federal Register on December 8, 1997 (62 FR 64621), to do the following:

> " . . . consider the need for a regulation that requires installation of ice detectors, aerodynamic performance monitors, or another acceptable means to warn flightcrews of ice accumulation on critical surfaces requiring crew action (regardless of whether the icing conditions are inside or outside of appendix C of 14 CFR part 25)."

The Aviation Rulemaking Advisory Committee (ARAC)

The ARAC was formally established by the FAA on January 22, 1991 (56 FR 2190), to provide advice and recommendations concerning the full range of the FAA's safety-related rulemaking activity. The FAA sought this advice to develop better rules in less overall time, using fewer FAA resources than are currently needed. The committee provides the opportunity for the FAA to obtain firsthand information and insight from interested parties regarding proposed new rules or revisions of existing rules.

There are 64 member organizations on the committee, representing a wide range of interests within the aviation community. Meetings of the committee are open to the public, except as authorized by section 10(d) of the Federal Advisory Committee Act.

The ARAC establishes working groups to develop proposals to recommend to the FAA for resolving specific issues. Tasks assigned to working groups are published in the Federal Register. Although working group meetings are not generally open to the public, all interested parties are invited to participate as working group members. Working groups report directly to the ARAC, and the ARAC must accept a working group proposal before that proposal can be presented to the FAA as an advisory committee recommendation.

The activities of the ARAC will not, however, circumvent the public rulemaking procedures. After an ARAC recommendation is received and found acceptable by the FAA, the agency proceeds with the normal public rulemaking procedures. Any ARAC participation in a rulemaking package will be fully disclosed in the public docket.

In response to the FAA's tasking of December 8, 1997 (see above), ARAC's Ice Protection Harmonization Working Group (IPHWG) developed recommendations for

FAA rulemaking to address flight in icing conditions. The ARAC accepted those recommendations and presented them to the FAA. The FAA has reviewed and accepted those recommendations, and has based the rulemaking proposal contained in this NPRM on them.

DEVELOPMENT OF THE PROPOSAL

Review Process

To address the FAA's tasking, the IPHWG followed a process consisting of the following five elements:

1. Review of the airplane icing related accident/incident history,
2. Identification of safety concerns,
3. Identification of the airplanes subject to the safety concerns (i.e., applicability),
4. Identification of various means to address the safety concerns, and
5. Review of the technology available to allow compliance with any proposed methods of addressing the safety concerns.

These five elements are discussed in more detail below.

1. Accident/Incident History Review

The IPHWG reviewed the airplane icing related accident/incident history and developed a database of approximately 1,300 worldwide icing-related accident and incident reports. The IPHWG then refined the database by:

- Removing duplicate entries and reports with insufficient data.
- Removing elements that were not relevant to inflight airframe icing problems, such as reports related to ground deicing and carburetor icing.

- Excluding single-engine piston airplanes, because most of these airplanes are not certificated for flight in icing. (Although a few of these airplanes may be certificated and equipped for flight in icing, the IPHWG considered that their exclusion would not affect the outcome of the review.)
- Removing reports involving multi-engine piston airplanes that were not certificated for flight in icing.
- Removing reports of events in which externally aggravating circumstances existed, such as operation of the airplane outside of its weight and balance limitations, descent below published minimums, or other reasons not related to airplane icing.

The IPHWG reviewed the remaining events and identified 61 events that were relevant to the task of determining the need for an ice detector. The IPHWG applied the following criteria to make this determination:

- Was there ice accretion that was not known to the flightcrew?

and

- Would knowledge of this ice accretion have made a difference to the outcome of the accident or incident?

Based on these 61 events, the IPHWG concluded that there is substantive documented accident and incident history in which the existing level of flightcrew cognizance of ice buildup on airframe surfaces is not adequate.

2. Safety Concerns

Activation of Airframe Ice Protection Systems (IPS). The airplane icing-related accident/incident history review revealed accidents and incidents where the flightcrew either:

- was completely unaware of ice accumulation on the airframe, or
- was aware of ice accumulation, but judged that it was not significant enough to warrant operation of the IPS.

From this, the IPHWG concluded that flightcrews must be provided with a clear means to know when to activate the IPS.

Exit Icing Conditions. The database contains reports of accidents and incidents where the IPS was operated according to accepted procedures, yet the ice accretions still created degradations that led to an event. Therefore, the IPHWG concluded that the flightcrew must be provided with a means to know if the airplane is in conditions conducive to ice accumulation that warrant the flightcrew taking actions to exit those icing conditions.

3. Applicability

Activation of Airframe Ice Protection Systems (IPS). The IPHWG examined the accident and incident history and found that discriminating design factors exist, such as wing chord length or airplane weight, that significantly reduce the risk of icing accidents and incidents. These discriminators were applied to the IPHWG recommended Operation Rule proposals, which are retrospective and apply to airplane types currently in service. However, the IPHWG recommended that a certification rule

dealing with ice detectors should not be limited to a specific group of airplanes because of past performance. Future airplane designs may change and a similar safety record may not be achieved. Therefore, reliance on past performance for future airplane designs would not be prudent.

Exit Icing Conditions.

There have been a number of accidents and incidents caused by the uncommanded deflections of reversible flight controls in both pitch and roll axes in icing conditions. These uncommanded deflections were the result of ice accreting ahead of the control surfaces, either aft of the protected area or on the protected area when the IPS was not activated. This resulted in airflow separation over a control surface. Such an airflow separation changes the pressure distribution on the control surface. The resulting control force change may be quite large, with significant difficulty for the flightcrew to manage. In some cases, the flightcrew may not be able to regain control of the airplane.

There is no history in the database of accidents or incidents due to uncommanded rudder deflections. Due to engine inoperative and crosswind landing requirements, the rudder is designed for operation at high deflection angles without force reversal. Normal airplane operation does not expose the vertical stabilizer to high sideslip angles (angle-of-attack), thereby leaving a large stall margin.

For irreversible flight controls, the control surface actuators are sized to maintain the control surface in its commanded position throughout the airplane's flight envelope, including high-speed dive. This results in the design loads for the actuators being larger than the loads induced by airflow separation caused by ice accretions aft of the airplane's

protected areas. Therefore, airplanes with irreversible flight controls have not experienced uncommanded control surface deflection caused by ice accretions.

This caused the IPHWG to maintain unpowered flight controls as a discriminator in the proposed cert rule 25-1420 pertaining to exit of icing conditions.

4. Possible Means of Addressing the Safety Concerns

Activation of Airframe Ice Protection Systems (IPS). For some types of aircraft previously certified, the safety concern of when to activate the IPS has already been partially addressed by Airworthiness Directives (AD's). The FAA has issued AD's to require activation of pneumatic deicing boots at the first signs of ice accumulation on the airplane. These AD's relieve the pilot of determining if the amount of ice accumulated on the wing warrants activation of the IPS. However, activation of the deicing boots is still subject to the flightcrew's observation of ice accumulations, and such observations can be difficult during times of high workload, operations at night, or when clear ice has accumulated. Also, the difficulties of observing ice accumulations is applicable to any IPS that relies on the flightcrew's observations for activating the system, not just pneumatic deicing boots.

The IPHWG concluded that an improved means to address these situations for future aircraft would be to require installation of a device that would alert the flightcrew when it was appropriate to activate the IPS. A primary ice detection system would be one acceptable means to alert the flightcrew. It could either automatically activate the IPS, or provide an indication to the flightcrew when the system must be activated. An advisory ice detection system, in conjunction with substantiated visual cues, will provide a much

higher level of safety than visual cues alone. These means would mitigate the effects of human sensory limitations and of inadequate attention.

An alternative to requiring the installation of an ice detector would be to require that the IPS be operated whenever the airplane is operating in conditions conducive to airframe icing. The IPS would be operated in these conditions during all phases of flight, unless it can be shown that the IPS need not be activated during certain phases of flight. In this case, the flightcrew would initiate the ice protection system in response to a specific air temperature threshold and the presence of visible moisture. Because temperature and visible moisture information is readily available and unambiguous, deciding when to initiate the system would require little increased effort by the flightcrew.

The IPS continuous operation approach has disadvantages with respect to increased maintenance due to increased time in operation. However, it presents great advantages with respect to flightcrew workload and procedural reliability. It is consistent with systems used as anti-ice systems and is the procedure in use for many thermally anti-iced small jets. The IPHWG noted that small jets that used these procedures were absent from the event data base. The IPHWG considered that this procedure could be used as an alternative to an ice detection system.

The flightcrew must be provided with a clear means to know when to activate the IPS both for the initial activation and on a continuing basis. The FAA is concerned with the flightcrew workload created if an IPS must be manually cycled. An IPS that is automatically cycled or operates on a continuous basis (for example, an anti-icing system)

does not create this additional workload and, therefore, is not a concern. The workload can be alleviated by equipping airplanes with a system that automatically cycles the ice protection system or with an ice detection system that alerts the flightcrew each time the IPS must be cycled.

Exiting Icing Conditions. The safety concern of when to exit icing conditions was partially addressed for existing airplanes in 1996 by a series of AD's that the FAA issued and further addressed by the IPHWG Operating Rule proposals. [AD 96-09-22, amendment 39-9698, (61 FR 20674, May 7, 1996), is typical of these AD's.] The AD's require certain airplanes to exit icing when the conditions exceed the design conditions of the ice protection equipment. Generally, the visual cues for determining that the flightcrew must act to exit icing conditions are subjective and can result in varying interpretations. Terms such as, "unusually extensive ice," ice that is "not normally observed," and ice that is "farther aft than normally observed" are used in the AD's. These are all variable terms that are largely dependent on flightcrew experience. The IPHWG concluded that more definitive means of determining when the flightcrew should exit icing conditions are needed.

As previously discussed, NTSB recommendation A-96-56 states that if safe operations in certain icing conditions cannot be demonstrated by the manufacturer, operational limitations should be imposed to prohibit flight in such conditions. The current state of the art in "icing conditions that are conducive to ice accumulation aft of the airframe's protected areas" do not allow accurate investigation into the aircraft flying qualities with such accretions. The ability to determine flight characteristics with such conditions is

dependent on the development of engineering definitions for these conditions and further developments in the engineering tools used to examine the ice accretions developed under these conditions.

It is recognized that the proposed rule does not permit an option that would allow continued flight in such conditions. This is due to the inability to demonstrate handling qualities given the existing state of knowledge on such conditions. The IPHWG is tasked with future work to define such conditions and has recommended future developments of the engineering tools in this respect. However, this work is ongoing and will not be available in the time frame of the proposed certification rule. The rule as proposed addresses the NTSB recommended safety concern by requiring the identification of such conditions with subsequent exit.

After the completion of the IPHWG tasking to define a supercooled large droplet environment and further maturity of the engineering tools, future rulemaking may be required to provide an option other than exiting the conditions. Much of the framework for criteria to be used in evaluating the effects of such accretions is already in the ARAC approval process. The Flight Test Harmonization Working Group (FTHWG) has recommended proposed rulemaking on defining acceptable flight characteristics in icing conditions. These proposals were drafted to accommodate possible modifications of Appendix C of 14 CFR Part 25 to account for large drop conditions. It is expected that these proposed rules will be used in defining acceptable criteria for handling quality

evaluations to ensure that aircraft can either safely transition the conditions or safely exit them once the ability to define and simulate such conditions are available.

5. Technology

To ensure that viable means exist for compliance with any proposed methods of addressing the safety concerns, the IPHWG reviewed the current state of technology with regard to ice detectors and aerodynamic performance monitors.

Ice detector technology is sufficiently mature that there currently are available several methods that can reliably alert the flightcrew as to when the ice protection system should be activated. This type of technology already has been certificated on various airplanes as either an advisory or a primary means of determining when the ice protection systems should be activated.

One ice detection system to indicate when a de-icing ice protection system should be initially activated and subsequently cycled is commercially available. Sensors for such ice detection systems, installed on the protected surfaces, sense the accumulation of ice that is sufficient to warrant cycling of a deicing system. Other ice detection systems capable of sensing the rate of ice accumulation may be used to indicate when a deicing IPS should be cycled based on ice accumulation from the preceding cycling of the system. The IPHWG, therefore, considers that these existing technologies could be further developed to effectively indicate when the initial and subsequent cycling of a deicing IPS should occur.

However, an ice detection system with the capability to alert the flightcrew when to exit icing conditions would have to be able to detect when:

a. the icing conditions encountered exceed the criteria to which the airplane was certificated; or

b. ice is accreting on surfaces of the airplane where it could prove hazardous and that were not addressed in the airplane's icing certification.

Some ice detection systems currently installed on airplanes have the capability to detect and alert the flightcrew that ice is accreting on sensor elements of the detector. Depending upon the intended application of these detectors, ice accretions of approximately 0.5 mm or less are detectable. However, these detectors only measure ice accretions and are not able perform either of the functions identified as a. and b., above.

Due to the limitations of ice detector systems and the immature development of aerodynamic performance monitors, the IPHWG considered additional means for the flightcrew to know when they should exit icing conditions.

It is feasible for the current ice detector technology to identify the existence of ice aft of the protected areas. Based on the accident and incident history and the current state of ice detector technology, the IPHWG recommended that the regulations be revised to address the known safety concern of ice accumulations aft of the airframe's ice protection systems on airplanes with reversible flight controls in the pitch or roll axis. The FAA accepted that recommendation, and the subject of this NPRM is limited to addressing that

known safety concern. The FAA will consider further rulemaking if improvements occur in the technology of the ice detectors or aerodynamic performance monitors.

The IPHWG also acknowledged that, instead of an ice detector, it might be possible to use the flightcrew's observation of ice accretion on reference surfaces, provided that the visual cues are substantiated for the specific airplane. This may appear to be inconsistent with the earlier determination that visual cues should not be relied upon for determining when the ice protection system should be activated. However, the visual cues would only be acceptable if the surface was close to the flightcrew and easily observable, such as icing on the side window of the flight deck.

The relevant icing accidents and incidents occurred on airplanes equipped with pneumatic deicing boots. However, the accumulation of ice aft of the protected areas due to large droplet icing conditions can occur on any airplane, regardless of the type of ice protection system installed on it. Therefore, the IPHWG recommended that any revision to the current regulations should be applicable regardless of the type of ice protection system installed.

DEFINITION OF TERMS

For the purposes of this proposed rule, the following definitions are applicable. These definitions of terms are intended for use only with this rule:

a. **Advisory ice detection system:** An advisory system annunciates the presence of ice accretion or icing conditions. The flightcrew is responsible for monitoring the icing conditions or ice accretion as defined in the Airplane Flight Manual (AFM), typically using total air temperature and visible moisture criteria, visible ice accretion, or specific airframe

ice accretion thickness, and activation by the flightcrew of the anti-icing or de-icing system(s) remains a requirement. The advisory system provides information to advise the flightcrew of the presence of ice accretion or icing conditions, but it can only be used in conjunction with other means to determine the need for, or timing of, activating the anti-icing or de-icing system.

b. **Airframe icing:** Ice accretions on portions of the airplane, with the exception of the propulsion system, on which supercooled liquid droplets may impinge.

c. **Anti-Icing:** The prevention of ice formation or accumulation on a protected surface, either:

- by evaporating the impinging water; or
- by allowing it to run back and off the surface or freeze on non-critical areas.

d. **Automatic cycling mode:** A mode of operation of the airframe de-icing system that provides repetitive cycles of the system without the need for the pilot to select each cycle. This is generally done with a timer, and there may be more than one timing mode.

e. **Deicing:** Removal or the process of removal of an ice accretion after it has formed on a surface.

f. **Irreversible flight controls:** All of the force required to move the pitch, roll, or yaw control surfaces is provided by hydraulic or electric actuators, the motion of which is controlled by signals from the flight deck controls. Loads generated at the control

surfaces themselves are reacted against the actuator and its mounting, and cannot be transmitted directly back to the flight deck controls.

g. **Large droplet conditions conducive to ice accumulation aft of the airframe's protected area:** Conditions containing a population of supercooled droplets sufficiently larger than those provided for in Appendix C (of 14 CFR part 25) to cause ice accretions aft of the protected areas. The accumulation mechanism aft of the protected surface may be by direct impingement and accretion, or delayed freezing of large droplets that impinge further forward. These conditions may be aircraft-dependent as a consequence of the geometry of the airfoil and the limits of protected areas.

h. **Monitored Surface:** The surface of concern regarding ice hazard (for example, the leading edge of the wing).

i. **Primary ice detection system:** The means used to determine when the IPS must be activated. The system annunciates the presence of ice accretion or icing conditions, and may also provide information to other aircraft systems. A primary automatic system automatically activates the anti-icing or de-icing systems. With a primary manual system, the flightcrew activates the IPS upon indication from the system.

j. **Reference Surface:** The surface where an ice detection sensor is located or where a visual cue is located remotely from the surface of concern regarding ice hazard (for example, a propeller spinner).

k. **Reversible flight controls:** The flight deck controls are connected to the pitch, roll, or yaw control surfaces by direct mechanical linkages, cables, or push-pull rods, such that pilot effort produces motion or force about the hinge line. Conversely,

force or motion originating at the control surface (through aerodynamic loads, static imbalance, or trim tab inputs, for example) is transmitted back to flight deck controls.

- Aerodynamically boosted flight controls: Reversible flight control systems that employ a movable tab on the trailing edge of the main control surface linked to the pilot's controls or to the structure in such a way as to produce aerodynamic forces that move, or help to move, the surface. Among the various forms are flying tabs, geared or servo tabs, and spring tabs.

- Power-assisted flight controls: Reversible flight control systems in which some means is provided, usually a hydraulic actuator, to apply force to a control surface in addition to that supplied by the pilot to enable large surface deflections to be obtained at high speeds.

l. **Static air temperature:** The air temperature as would be measured by a temperature sensor not in motion with respect to that air. This temperature is also referred to in other documents as "outside air temperature," "true outside temperature," or "ambient temperature."

m. **Substantiated visual cues:** Ice accretion on a reference surface identified in the AFM that is observable by the flightcrew. (**NOTE**: Visual cues used to identify ice addressed in appendix C will differ from those used to identify large droplet ice.)

DISCUSSION OF THE PROPOSED RULE

The FAA has reviewed and accepted the recommendations that the IPHWG developed and ARAC approved. The FAA proposes to amend the current part 25 regulations in two areas:

1. Activation of the IPS

The first area addresses the possibility of the flightcrew failing to recognize that the airframe ice protection procedures should be initiated. The proposed rule would require a method of ice detection which enables activation of the airframe ice protection system (IPS) for the initial cycles and any subsequent cycles through:

- a primary ice detection system, automatic or manual; or
- visual cues for recognition of ice accretion on a specified surface, combined with an advisory ice detection system that alerts the flight crew; or
- identification of icing conditions, as defined by an appropriate static or total air temperature and visible moisture during all phases of flight, unless it can be substantiated that the ice protection system need not be operated during specific phases of flight;
- if the ice protection system operates in a cyclical manner: a system that automatically cycles the ice protection system, or an ice detection system that is effective for the initial activation of the ice protection system and subsequent cycles.

Each of these methods provides a clear means for addressing the safety concern of when the IPS must be activated.

2. Indication of Ice Accumulation Aft of the Airframe's Protected Areas

The second area of the proposed rule addresses the possibility of ice accumulations on the airplane that could lead to hazardous operating conditions if the airplane is allowed to stay in icing conditions. The rule would be limited to airplanes equipped with reversible flight controls in the pitch or roll axis, because these aircraft can be subject to uncommanded control surface deflections caused by ice accretions. The proposed rule would require a method to alert the crew that they should exit icing conditions. Two options would be:

- Visual cues must be defined that will enable the flightcrew to determine that the airplane is in large droplet conditions conducive to ice accumulation aft of the airframe's protected areas, Or
- The airplane must be equipped with a system that alerts the flightcrew that the airplane is in large droplet conditions conducive to ice accumulation aft of the airframe's protected areas.

These proposed requirements address the known problem of large droplet ice accretions aft of protected surfaces causing uncommanded pitch or roll control surface deflection that may result in loss of control of the airplane. The FAA will consider further rulemaking if improvements occur in ice detection system technologies.

The determination that the airplane is operating in large droplet conditions conducive to ice accumulation aft of the airframe's protected areas could be based on:

- a measurement of ice accumulations on the airframe, or
- a measurement of supercooled liquid droplet diameters , or
- visual observation of ice accumulations on the airframe.

The intent of the proposed rule is to provide methods to detect when the airplane is experiencing these icing conditions. Therefore, forecast icing conditions are not to be considered when complying with this proposed rule.

FAA Advisory Material

In addition to the amendment proposed in this notice, the FAA has developed an Advisory Circular (AC) that provides guidance as to acceptable means of demonstrating compliance with this proposed rule. Comments on the proposed AC are requested by separate notice published elsewhere in this issue of the Federal Register.

Other Related Rulemaking

The FAA has proposed a new operations regulation that would revise 14 CFR part 121 and require actions similar to those in this proposed part 25 rule. The proposed operations rule would be applicable to airplanes with a maximum certificated takeoff weight less than 60,000 pounds. It would require either the installation of ice detection equipment, or changes to the Airplane Flight Manual to ensure timely activation of the ice protection system. For airplanes with reversible flight controls in the pitch and/or roll axis, the proposed operations rule would require that either :

- visual cues be defined that enable the flightcrew to determine that the airplane is in large droplet conditions conducive to ice accumulation aft of the airframe's protected areas; or

- the airplane be equipped with an alert to notify the flightcrew that the airplane is in large droplet conditions conducive to ice accumulation aft of the airframe's protected areas.

On being aware of ice accumulation aft of the airframe protected areas, the rule requires the pilot in command to take action to exit the conditions in which any ice accretion is occurring.

Paperwork Reduction Act

The Paperwork Reduction Act of 1995 (44 U.S.C. 3507(d)) requires that the FAA consider the impact of paperwork and other information collection burdens imposed on the public. We have determined that there are no new information collection requirements associated with this proposed rule.

International Compatibility

In keeping with U.S. obligations under the Convention on International Civil Aviation, it is FAA policy to comply with International Civil Aviation Organization (ICAO) Standards and Recommended Practices to the maximum extent practicable. The FAA determined that there are no ICAO Standards and Recommended Practices that correspond to these proposed regulations.

Executive Order 12866 and DOT Regulatory Policies and Procedures

[APO is responsible for drafting the Regulatory Evaluation Summary. Summary of the economic evaluation prepared by APO will be inserted here.]

Economic Evaluation, Regulatory Flexibility Determination, International Trade Impact Assessment, and Unfunded Mandates Assessment

Proposed changes to Federal regulations must undergo several economic analyses. First, Executive Order 12866 directs that each Federal agency propose or adopt a regulation only upon a determination that the benefits of the intended regulation justify its costs. Second, the Regulatory Flexibility Act of 1980 requires agencies to analyze the economic impact of regulatory changes on small entities. Third, the Trade Agreements Act (19 U.S.C. section 2531-2533) prohibits agencies from setting standards that create unnecessary obstacles to the foreign commerce of the United States. In developing U.S. standards, this Trade Act also requires agencies to consider international standards and, where appropriate, use them as the basis of U.S. standards. And fourth, the Unfunded Mandates Reform Act of 1995 requires agencies to prepare a written assessment of the costs, benefits and other effects of proposed or final rules that include a Federal mandate likely to result in the expenditure by State, local or tribal governments, in the aggregate, or by the private sector, of $100 million or more annually (adjusted for inflation.)

In conducting these analyses, FAA has determined this rule 1) has benefits which do justify its costs, is not a "significant regulatory action" as defined in the Executive Order and is "significant" as defined in DOT's Regulatory Policies and Procedures; 2) will not have a significant impact on a substantial number of small entities; 3) reduces barriers to international trade; and 4) does not impose an unfunded mandate on state, local, or tribal governments, or on the private sector. These analyses, available in the docket, are summarized below.

Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) of 1980, (5 U.S.C. 601 et seq.) directs the FAA to fit regulatory requirements to the scale of the business, organizations, and governmental jurisdictions subject to the regulation. We are required whether a proposed or final action will have a significant impact on a substantial number of "small entities" as defined by the Act. If we find that the action will have a significant impact, we must do a "regulatory flexibility analysis."

International Trade

The Trade Agreement Act of 1979 prohibits Federal agencies from engaging in any standards or related activity that create unnecessary obstacles to the foreign commerce of the United States. Legitimate domestic objectives, such as safety, are not considered unnecessary obstacles. The statute also requires consideration of international standards and where appropriate, that they be the basis for U.S. standards. In addition, consistent with the Administration's belief in the general superiority and desirability of free trade, it is the policy of the Administration to remove or diminish, to the extent feasible, barriers to international trade, including both barriers affecting the export of American goods and services to foreign countries and barriers affecting the import of foreign goods and services to into the U.S.

In accordance with the above statute and policy, the FAA has assessed the potential effect of this proposed and has determined that it would have only a domestic impact and therefore no affect on any trade-sensitive activity.

Regulations Affecting Interstate Aviation in Alaska

Section 1205 of the FAA Reauthorization Act of 1996 (110 Stat. 3213) requires the Administrator, when modifying regulations in title 14 of the CFR in manner affecting interstate aviation in Alaska, to consider the extent to which Alaska is not served by transportation modes other than aviation, and to establish such regulatory distinctions as he or she considers appropriate. Because this proposed rule would apply to the certification of future designs of transport category airplanes and their subsequent operation, it could, if adopted, affect interstate aviation in Alaska. The FAA therefore specifically requests comments on whether there is justification for applying the proposed rule differently in interstate operations in Alaska.

Unfunded Mandates Reform Act

[APO is responsible for developing this analysis.]

The Unfunded Mandates reform Act of 1995 (2 U.S.C. §§ 1532-1538) requires the FAA to assess the effects of Federal Regulatory actions on state, local, and tribal governments, and on the private sector of proposed rules that contain a Federal intergovernmental or private sector mandate that exceeds $100 million in any one year. This action *[does or does not]* contain such a mandate.

Executive Order 13132, Federalism

The FAA has analyzed this proposed rule under the principles and criteria of Executive Order 13132, Federalism. We determined that this action would not have a substantial direct effect on the States, on the relationship between the national Government and the States, or on the distribution of power and responsibilities among the

various levels of government. Therefore, we determined that this notice of proposed rulemaking would not have federalism implications.

Plain Language

In response to the June 1, 1998 Presidential memorandum regarding the use of plain language, the FAA re-examined the writing style currently used in the development of regulations. The memorandum requires federal agencies to communicate clearly with the public. We are interested in your comments on whether the style of this document is clear, and in any other suggestions you might have to improve the clarity of FAA communications that affect you. You can get more information about the Presidential memorandum and the plain language initiative at http://www.plainlanguage.gov.

Environmental Analysis

FAA Order 1050.1D defines FAA actions that may be categorically excluded from preparation of a National Environmental Policy Act (NEPA) environmental impact statement. In accordance with FAA Order 1050.1D, appendix 4, paragraph 4(j), this proposed rulemaking action qualifies for a categorical exclusion.

Energy Impact

The energy impact of the notice has been assessed in accordance with the Energy Policy and Conservation Act (EPCA) Pub. L. 94-163, as amended (42 U.S.C. 6362) and FAA Order 1053.1. It has been determined that the notice is not a major regulatory action under the provisions of the EPCA.

List of Subjects in 14 CFR Part 121

Aircraft, Aviation safety, Reporting and record keeping requirements, Safety, Transportation.

The Proposed Amendment

In consideration of the foregoing, the Federal Aviation Administration proposes to amend part 25 of Title 14, Code of Federal Regulations, as follows:

PART 25—AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY AIRPLANES

1. The authority citation for part 25 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701, 44702 and 44704

2. Add new paragraphs (e), (f), and (g) to § 25.1419 to read as follows:

§ 25.1419 Ice Protection.

* * * * *

(e) One of the following methods of icing detection must be provided to indicate when the airframe ice protection system must be activated:

(1) A primary ice detection system that automatically activates or alerts the flightcrew to activate the airframe ice protection system; or

(2) A definition of visual cues for recognition of ice accretion on a specified surface combined with an advisory ice detection system that alerts the flightcrew to activate the airframe ice protection system; or

(3) Identification of conditions conducive to airframe icing as defined by an appropriate static or total air temperature and visible moisture during all phases of flight,

unless it can be shown that the ice protection system need not be operated during specific phases of flight.

(f) If the ice protection system requires repeated cycling after initial activation:

(1) the airplane must be equipped with a system that automatically cycles the ice protection system, or

(2) an ice detection system must be provided to alert the flight crew each time the ice protection system must be cycled.

(g) Procedures for operation of the ice protection system must be established.

3. Add a new § 25.1420 to read as follows:

§ 25.1420 Exit large droplet conditions.

(a) For airplanes with reversible roll or pitch controls: if certification for flight in icing conditions is desired, one of the following must be provided to alert the flightcrew that they must exit icing conditions

(1) Substantiated visual cues that enable the flightcrew to determine that the airplane is in large droplet conditions conducive to ice accumulation aft of the airframe's protected areas; or

(2) A system that alerts the flightcrew that the airplane is in large droplet conditions conducive to ice accumulation aft of the airframe's protected areas.

(b) Procedures for exiting icing conditions must be established.

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